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# TRANSPORTATION IMPACT FEE STUDY

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Prepared for:


The City of Winooski, Vermont

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Cover Image Credit: Ken Gallager (2019)

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**LIST OF ABBREVIATIONS**

| | |
|---|---|
| ACS | American Community Survey |
| AHS | American Housing Survey |
| CCI | Construction Cost Index |
| CCRPC | Chittenden County Regional Planning Commission |
| CIP | Capital Improvement Program |
| CLA | Common Level of Appraisal |
| GMT | Green Mountain Transit |
| ITE | Institute of Transportation Engineers |
| NHTS | National Household Travel Survey |
| TAZ | Traffic Analysis Zone |
| TDM | Transportation Demand Management |
| TMP | Transportation Master Plan |
| VMT | Vehicle Miles Traveled |

# 1.0 INTRODUCTION

This impact fee study report proposes how land-use development in the city of Winooski can accommodate new demands it places on existing infrastructure. Impact fees are a type of land-use regulation that local governments use to generate revenue to construct additional mobility capacity to accommodate this demand. The city of Winooski retained RSG to develop this needs study to identify a fair and equitable impact fee structure for its transportation investments.

Vermont statute authorizes municipalities to levy impact fees on new development. This purpose of these fees is to allocate the cost of new capital facilities to the development that will benefit from those facilities.[1] This can include fees to offset the costs of facilities built in the past with excess capacity for anticipated future development; it can also include facilities planned to be built to accommodate future development. The statute states that the costs of such infrastructure should only include the portion associated with new capacity to accommodate the future development's demand.

The methodology for the transportation impact fee follows a "needs-based" (also known as a "plan-based") approach. It does this by identifying the future transportation capacity necessary to mitigate the impacts of additional users generated by future land-use development on the existing standards of service that users experience. Figure 1 outlines the impact fee development process.

**FIGURE 1: IMPACT FEE PROCESS**


*Source: RSG*

[1] 24 V.S.A. § 5200

This impact fee study report outlines the future growth anticipated in the city of Winooski. It then documents the basis for implementing a transportation impact fee, the purpose of which is to pay for additional capacity associated with the increased demand for transportation mobility while conforming to statutory requirements.

## 1.1 LEGAL BACKGROUND

The American Planning Association, which is a national organization dedicated to supporting local communities and planning processes, has developed standards for impact fees. These standards are as follows:[2]

- *The imposition of a fee must be rationally linked (the "rational nexus") to an impact created by a particular development and the demonstrated need for related capital improvements pursuant to a capital improvement plan and program.*
- *Some benefit must accrue to the development as a result of the payment of a fee.*
- *The amount of the fee must be a proportionate fair share of the costs of the improvements made necessary by the development and must not exceed the cost of the improvements.*
- *A fee cannot be imposed to address existing deficiencies except where they are exacerbated by new development.*
- *Funds received under such a program must be segregated from the general fund and used solely for the purposes for which the fee is established.*
- *The fees collected must be encumbered or expended within a reasonable timeframe to ensure that needed improvements are implemented. Six years in Vermont.*
- *The fee assessed cannot exceed the cost of the improvements, and credits must be given for outside funding sources (such as federal and state grants, developer initiated improvements for impacts related to new development, etc.) and local tax payments which fund capital improvements, for example.*
- *The fee cannot be used to cover normal (day to day) operation and maintenance or personnel costs, but must be used for capital improvements, or under some linkage programs, affordable housing, job training, child care, transit operations, etc. This expectation has to define costs attributed to mitigating the impacts associated with additional land use development.*

Typical management activities:

- *The fee established for specific capital improvements should be reviewed at least every two years to determine whether an adjustment is required, and similarly the capital improvement plan and budget should be reviewed at least every 5 to 8 years.*

[2] American Planning Association. “APA Policy Guide on Impact Fees.” Available at: https://www.planning.org/policy/guides/adopted/impactfees.htm.

- *Provisions must be included in the ordinance to permit refunds for projects that are not constructed, since no benefit will have manifested.*
- *Impact fee payments are typically required to be made as a condition of approval of the development, either at the time the building or occupancy permit is issued.*

Vermont's impact fee statute does not preclude using funds for administrative duties associated with the management of the impact fee program. Nationally, it is common practice to collect and expend impact fees to cover time and expenses associated with the creation, management, and other administration of the impact fee program. These funds often cover the salary portion of the impact fee administrator, staff time in the preparation and review of impact fee studies, consultant or staff time preparing impact fee needs reports, and ordinance support. Therefore, a 4% additional margin has been identified in this study as a reasonable cost for the administration of this program. The 4% is based on an annual impact fee revenue of approximately $90,000 per year (see Table 13) whereby the administrative fee will generate approximately $30,000-$40,000 every 10 years.

# 2.0 GROWTH AND DEVELOPMENT

The city of Winooski is the smallest and densest municipality in Vermont with 7,200 people living within 1.4 square miles. The density, proximity to Burlington, and junction between VT 15, US 2/7, and the I-89 interstate have given rise to a largely urban form with an extensive street and sidewalk network as well as a hub for public transit.

The City's Transportation Master Plan (TMP), completed in March 2017, is a comprehensive investigation into the existing transportation system, future growth and development, and projects to address future mobility needs. The TMP's Vision statement summarizes the priorities to identify future transportation investments:

> Winooski recognizes the significance of the transportation system in sustaining a vibrant, livable city by fostering a healthy community and strong local economy. Winooski's transportation system will meet the needs of the City's diverse population and will provide for safe, efficient, and convenient transportation choices for all users—including pedestrians, bicyclists, motorists and public transit riders. The City will invest in safe and regionally connected bicycle and pedestrian facilities to promote active transportation and increase the number or people that walk and bike in and through the City.[3]

## 2.1 POPULATION

The city of Winooski has a population of 7,203 as of the 2017 American Community Survey (ACS) five-year estimates, which makes it the eighth-most populous community within Chittenden County. The city is largely built out, with few undeveloped lots due to the recent increases in population associated with redevelopment. The population is expected to increase modestly, adding between 500 and 600 persons by 2040.

## 2.2 HOUSEHOLDS

The ACS estimates that, as of 2017, there are 3,303 housing units in the city—an increase of just over 300 units since the 2000 census. A minority of households (40.4%) are owner occupied, with an average of 2.29 persons per household. The remaining 59.6% of households are renter occupied, with 2.06 persons per household.[4]

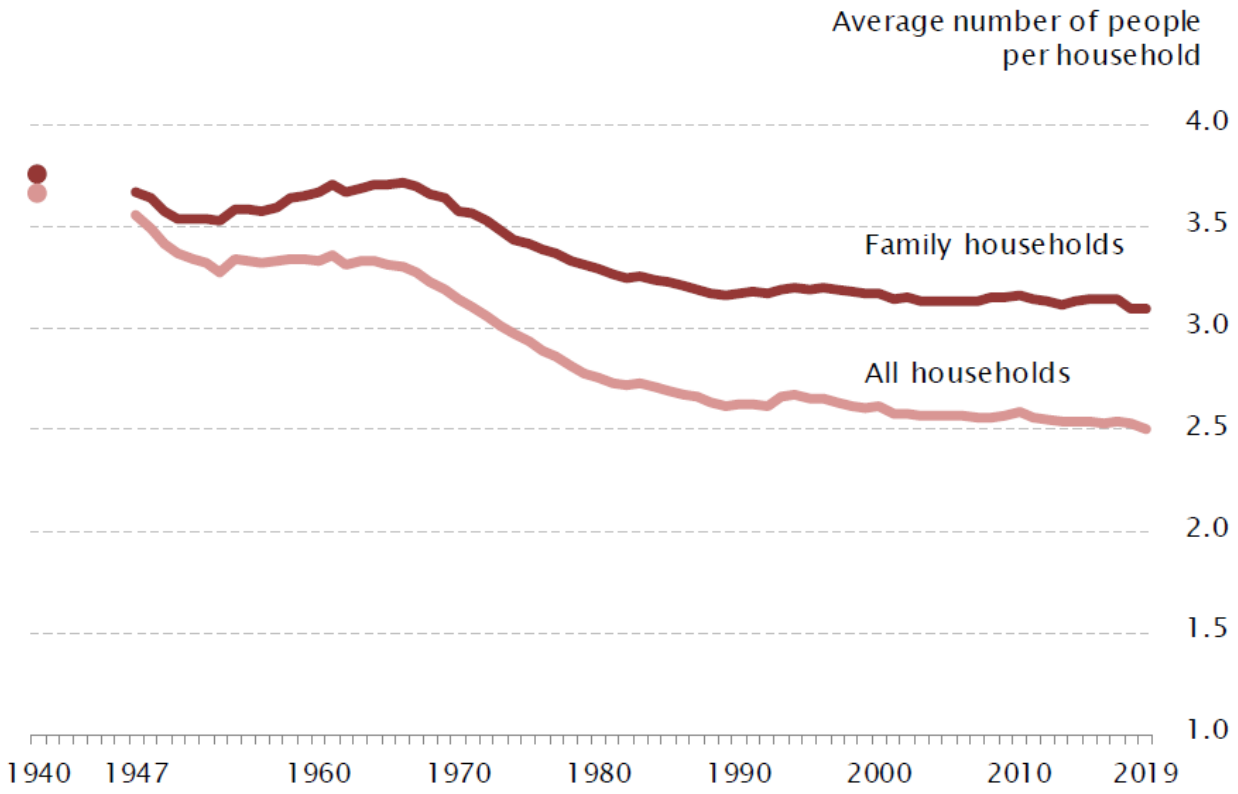
There have been attempts nationally to reduce the effect that transportation impact fees may have on housing costs, especially "affordable housing." Changing the assessment on the

[3] "Transportation Master Plan." Prepared for the City of Winooski and Chittenden County Regional Planning Commission. March 2017, p. 4. Available at: https://studiesandreports.ccrpcvt.org/wp-content/uploads/2017/03/Winooski-TMP-Final.pdf.
[4] 2017 American Community Survey five-year estimates.

square footage of the home, or on the number of bedrooms, provides a stronger relationship to the number of occupants and the amount of transportation impact..

Nationally, over the past half century, the average size (number of persons) of households has dropped from 3.67 persons per household in 1940 to 2.53 in 2016, as shown in Figure 2.

**FIGURE 2: AVERAGE HOUSEHOLD SIZE (1940–2016)**




*Source:* U.S. Census Bureau, Current Population Survey, Annual Social and Economic Supplements, 1940 and 1947 to 2019.

*Source: US Census Bureau*[5]

Winooski has experienced a similar trend, particularly among homeowners. The 2000 census indicated that the minority of the households (39.3%) are owner occupied, with an average of 2.47 persons per household. The remaining 60.7% of households are renter occupied, with 2.04 persons per household.[6] Since 2000, the City has seen stable rental household size but a slight

[5] US Census Bureau. "Historical Households Tables." December 2020. Available at: https://www.census.gov/data/tables/time-series/demo/families/households.html.
[6] 2017 American Community Survey five-year estimates.

decline in the average size of owner-occupied households. The 2017 breakdown of households and the number bedrooms is shown in Table 1.

**TABLE 1: BEDROOMS, BY HOUSEHOLD UNIT (FIVE-YEAR ACS)**

| HOUSEHOLD BEDROOM COUNT | COUNT | PERCENT |
|---|---|---|
| No Bedroom (I.e., Studio) | 236 | 7% |
| 1 Bedroom | 904 | 27% |
| 2 Bedrooms | 980 | 30% |
| 3 Bedrooms | 923 | 28% |
| 4 Bedrooms | 247 | 7% |
| 5 or More Bedrooms | 15 | 0% |
| **Total Housing Units** | **3,305** | **100%** |

The weighted average number of bedrooms per unit is 2.1. This is used later in the study process in the development of the impact fee credits.

## 2.3 EMPLOYMENT

The city of Winooski is a significant destination for commercial and industrial activity. As of 2017, there were 3,052 persons employed within the City's limits. Of these, 90.0% live outside of Winooski and commute in. The remaining 10% (305 persons) live and work in Winooski. The 2017 five-year ACS summarizes the jobs within the city of Winooski (Table 2).

**TABLE 2: DISTRIBUTION OF EMPLOYMENT SECTORS IN THE CITY OF WINOOSKI**

| NAICS DESCRIPTION | % OF WORKERS IN CITY OF WINOOSKI |
|---|---|
| Agriculture, forestry, fishing and hunting, and mining | <1% |
| Construction | 5% |
| Manufacturing | 23% |
| Wholesale trade | 1% |
| Retail trade | 8% |
| Transportation and warehousing, and utilities | 2% |
| Information | 2% |
| Finance and insurance, and real estate and rental and leasing | 4% |
| Professional, scientific, and management, and administrative and waste management services | 15% |
| Educational services, and health care and social assistance | 19% |
| Arts, entertainment, and recreation, and accommodation and food services | 11% |
| Other services, except public administration | 7% |
| Public administration | 2% |

Employed individuals within the city contribute to the demand for travel to, from, and within the city of Winooski. During the workday, various activities are carried out to support commercial activities. But there are also recreation and noncommercial trips generated.

# 3.0 TRANSPORTATION

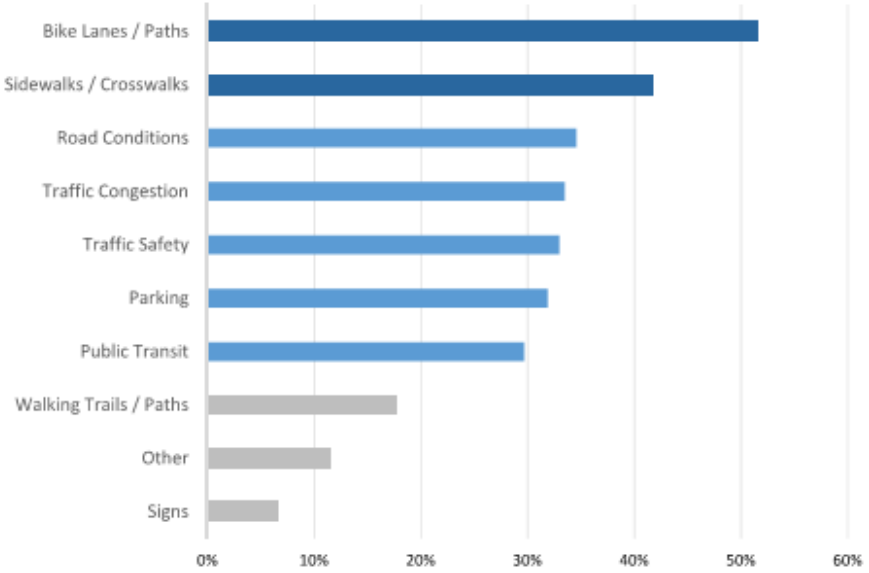
## 3.1 OVERVIEW

The city of Winooski has played an important role in the growth and development of the greater Burlington region. The city is located at the junction of three critical roadways (US 2/7, VT 15, and I-89), the proximity of power sourced from the Winooski River, and the rail line connecting Essex Junction to the city of Burlington.

The city has long been a place of intense transportation demand for through traffic, which are trips that simply pass through and are not related to the local land use. This demand has increased since the redevelopment of the core, an area in high demand as a generator of traffic. Considering this demand, the City completed the TMP in March 2017. It provides a comprehensive investigation into the existing transportation system, future growth and development, and projects to address future mobility needs.

The TMP described the existing conditions, identified possible improvements, and developed a set of priority projects through an extensive public engagement process. Figure 3 highlights the highest vote tallies for specific types of investments considered.

**FIGURE 3: WINOOSKI TMP—SUMMARY FROM FIRST-ROUND ONLINE SURVEY**




*Source: City of Winooski TMP*[7]

[7] "Transportation Master Plan." Prepared for the City of Winooski and Chittenden County Regional Planning Commission. March 2017, p. 25. Available at: https://studiesandreports.ccrpcvt.org/wp-content/uploads/2017/03/Winooski-TMP-Final.pdf.

A few key findings from public input on the project list are as follows:

- **Bicycle Facilities**: Providing bicycle accommodations across the Winooski River Bridge was the overall top-ranked project. Two-thirds of those surveyed chose this as one of their three top choices for bicycle facility options.
- **Pedestrian Facilities**: No single pedestrian facility action item was chosen as a top project by more than 50% of those surveyed. The North Street and Hood Street sidewalks received the fewest votes, with less than 20% selecting these as their top three choices, compared to 30%–49% for the other sidewalk options.
- **Roadway and Parking**: The Main Street and Malletts Bay gateways were identified as a top choice by almost two-thirds of those surveyed. Creating vehicular access to the Casavant Natural Area was scored as the lowest priority in this group.
- **Policy**: Expanding public transit is a strong top choice within this group and received 45% of voters' selections. Designating Union Street as a truck route registered as a low public priority, with less than 10% selecting this option as a top three choice.

The priority projects will continue to advance toward implementation. Project development and project finances are two critical stages of any project. Winooski desires to maximize the benefit of any applicable impact fees that can be leveraged to realize these projects. Overall, the priorities identified by the TMP align well with the projects identified in this impact fee study.

## 3.2 IMPACT FEE BASIS

Future development generates additional new local demand for travel that begins or ends within the city. Additional growth in population throughout the county and state also generates demand for travel, although those trips begin and end outside of the city; as a result, these trips are not directly associated with future development in Winooski. These trips are considered "through trips."

The impact fee analysis considers only local traffic generated by anticipated future development. The basic unit of analysis is the Peak Hour Trip End, which is either the origin or the destination of a trip. Any given trip has two trip ends—an origin and a destination. Any trip that either begins or ends within the city is a local trip for impact fee analysis purposes, as it is associated with locally regulated land uses.

The impact fee is assessed on the number of trips, regardless of travel mode. The Vermont State Legislature identified "complete street" principles under Act 34 H.198 of 2011 that defined transportation capacity consistently regardless of travel mode. The projects in this study add multimodal capacity and offer residents, employees, and patrons several modal travel options. Offering multimodal capacity options allows users to select the mode that works best for them and under the specific conditions of the moment. For example, expanding only transit capacity fails to benefit those who could walk or bike. Providing options such as a sidewalk also frees

capacity for other users who are unable to shift modes. A sidewalk may encourage someone who could walk to stop commuting by car, thereby creating road space for another user in a vehicle. Overall, net capacity increases in these examples and provides options for all road users. These options, in turn, increase the resiliency and redundancy of the system.

The impact fee is assessed on the number of trips generated during the PM peak hour. The PM peak hour is the typical design hour[8] in the city of Winooski. It is noted that specific developments may generate a significant number of vehicle trips outside the design hour. Some uses (a house of worship, for example) may have different peak hours of traffic generation. Cumulatively, however, the highest traffic volume at most locations in Winooski is during the PM peak design hour, as defined here.

Traffic impact fees are not assessed on trips that occur outside of the PM peak design hour. Limiting the period of assessment to the PM peak hour creates a common hour of analysis that is used by traffic impact studies and practitioners. By assessing a fee during a particular hour of analysis, the fee also acts as a transportation demand management (TDM) technique. This can encourage the development of land uses that generate travel demand outside of the peak hours. This results in a more efficient use of the existing transportation infrastructure by utilizing available capacity at other times of the day. This same principle goes for shifting modes. As congestion may increase for one mode of travel, some users will shift modes to utilize the available capacity.

[8] Design Hour in Vermont is defined as the thirtieth-highest hour of volume during the year.

# 4.0 FUTURE TRAVEL DEMAND

## 4.1 OVERVIEW

The city of Winooski is forecast to see an increase in employment and population over the coming decades. This growth will occur at a more modest rate than in other communities in Chittenden County given the mature form of the city. A travel demand model can account for and model future travel. The Chittenden County Regional Planning Commission (CCRPC) regional travel demand model is a comprehensive planning tool. It is used to forecast the number of trips and the amount of traffic to be generated by future growth and land-use development within Winooski and the county. The tool was used to estimate the amount of traffic growth likely by 2040, the future horizon used in this impact fee study.

## 4.2 OVERVIEW OF CHITTENDEN COUNTY TRANSPORTATION MODEL

In 2015, the CCRPC initiated a significant update to the regional travel demand model that included population and employment projections for each municipality for five-year increments out to 2050. The CCRPC forecasts were used to generate estimates of new traffic generation, vehicle miles traveled, and percentage of growth in traffic that is through versus local (see Section 3.0). The land-use changes forecast in the model were agreed to by the City for use in this impact fee assessment. In practice, this means that if at any point the land-use development trajectory changes from that modeled, this impact fee study should be revisited.

The model is a traditional four-step trip-based travel demand model. The four steps are iterated to achieve an optimized routing pattern with stable travel times. The steps are defined as follows:

- **Trip Generation**: Estimates the number of person trips produced and attracted to each traffic analysis zone (TAZ). The land-use inputs to the travel model were agreed with each community.
- **Trip Distribution**: Connects person trips between TAZs.
- **Mode Choice**: Splits person trips into single-occupant vehicles, shared vehicle trips, transit trips, or walk/bike trips.
- **Assignment**: Selects the shortest route for each vehicle and transit trip traveling from one TAZ to another based on distance and travel time.

## 4.3 TRIP GENERATION FORECASTS

This study incorporated the anticipated land-use changes to occur in Winooski by 2040. The land-use changes included household growth and increases in specific sectors of the economy. In total, an estimated 250 new housing units would be constructed, and 1,850 new employees would be based in Winooski by 2040.

**TABLE 3: LAND-USE CHANGES ANTICIPATED IN WINOOSKI (2015–2040)**

| RESIDENTIAL GROWTH | HOUSING UNITS |
|---|---|
| New households | 263 |
| **EMPLOYMENT GROWTH** | **EMPLOYEES** |
| Accommodations | 3 |
| Commercial | 508 |
| Industrial | 564 |
| Institutional | 97 |
| Educational | 167 |
| Retail | 224 |
| **Total Employment Growth** | **1,562** |

The land-use changes associated with the new housing units and commercial space were evaluated in the travel model in addition to all the other growth and changes in land uses within the county by 2040. The regional travel model accounts for growth in other communities within Chittenden County as well as estimated growth for trips that originate outside the county and for trips that may only pass through the county. While the model accounts for walking, biking, and transit, the trips that are outputs of the model are vehicle trips only.

The local land-use growth in Winooski and the growth occurring within Chittenden County and the state all increase the total vehicle miles traveled (VMT) on the streets in Winooski. Table 4 shows the portion of VMT growth associated with land use (origin or destination) in Winooski and total VMT using Winooski's roads, excluding any VMT on the I-89 interstate. The local share of the change in VMT is 57%.

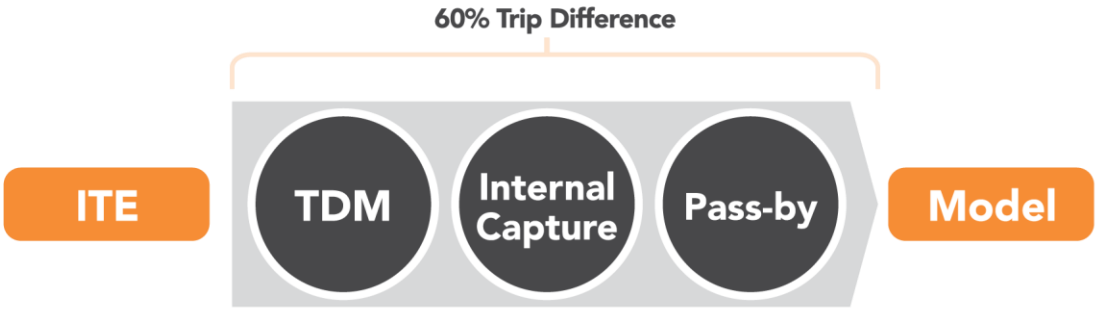
**TABLE 4: LOCAL VS. TOTAL VMT CHANGE**

| YEAR/CHANGE IN VMT | LOCAL VMT (NONHIGHWAY) | | TOTAL VMT (NONHIGHWAY) | |
|---|---|---|---|---|
| | PM | Daily | PM | Daily |
| 2015 | 2,314 | 27,037 | 4,694 | 56,589 |
| 2040 | 2,703 | 32,035 | 5,420 | 65,297 |
| Change in VMT | 389 | 4,997 | 726 | 8,708 |

Further adjustment is necessary to convert the travel model analysis into a multimodal forecast of total trip making in the city. The number of vehicle trips forecast from the travel model is the net result after the model accounts for several considerations. Much like a traffic study using the Institute of Transportation Engineers (ITE) Trip Generation manual must adjust for density, site location (e.g., urban, suburban), proximity to transit, and mix of nearby uses, the travel model accounts for all these factors. Specifically, the factors:

- TDM and nonauto travel.
- Internal capture (mix of complementary land uses within a travel analysis zone).
- Pass-by (trips that detour to a location en route to their primary destination).

**FIGURE 4: TRIP REDUCTION FACTOR**




*Source: RSG*

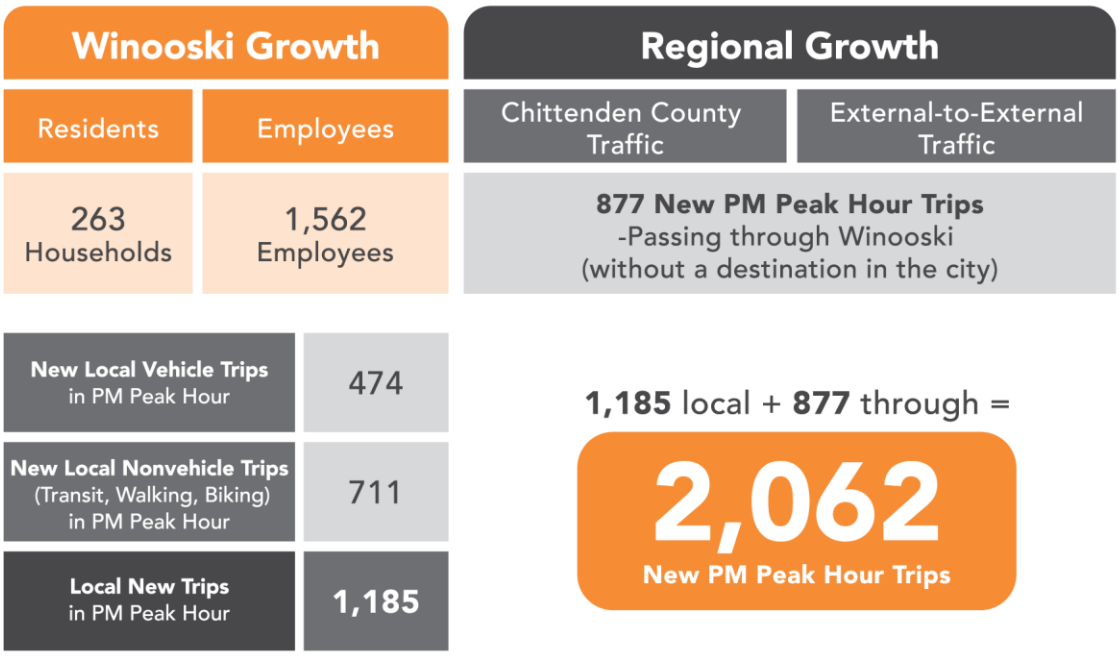
These adjustments are applicable throughout Winooski given the density, the small area of the city (only 1.4 square miles), and the diversity and mix of land uses. The density, diversity, and design (the three Ds) of the land uses enable individuals to travel between land uses without using major roads, are close enough to allow for walking and biking, and are the locations primarily served by transit.[9] The effect of the three Ds in Winooski reduces the net number of vehicle trips by 60% from what would have been generated in a traditional suburban context as analyzed using conventional ITE Trip Generation methods.[10]

[9] Robert Cervero, Kara Kockelman. 1997. "Travel demand and the 3Ds: Density, diversity, and design." *Transportation Research Part D: Transport and Environment, 2*(3), 199-219. https://doi.org/10.1016/S1361-9209(97)00009-6.

[10] The conventional ITE trip generation has been conducted using surveys from traditionally suburban areas predominately served by private automobile modes. The 10th edition started introducing new place type information as well as person trip data.

By 2040, new land-use development in Winooski is anticipated to generate an additional 474 new vehicle trips and 711 trips by other modes during the PM peak hour.[11] The combination of vehicle trips, nonmotorized trips, and trips that pass through the city are shown in Figure 5, resulting in 2,062 new total PM peak hour trips in Winooski by 2040.

**FIGURE 5: 2040 TRAFFIC GROWTH CHANGES**




*Source: RSG*

[11] The precision of these numbers in no way confers the accuracy of the forecasts. These are subject to numerous assumptions on land-use changes and regional transportation investments that may alter the course of expected land-use development.

# 5.0 PROJECTS

Three projects have been developed over the past 5 years through the course of several transportation studies, plans, and community conversations and are eligible for impact fee expenditures. They will improve mobility for residents and through traffic alike and accommodate the growth and development anticipated in Winooski.

Table 5 shows the three projects identified by the City for impact fee expenditures. The Main Street and East Allen Street projects involve some degree of replacement of existing capacity. Only the portion of new capacity (column B) is eligible for impact fee expenditures (see Appendix A). Column C shows the portion of the project that can be funded through impact fees and is used to calculate the base impact fee.

**TABLE 5: WINOOSKI TRANSPORTATION IMPACT FEE PROJECTS**

| PROJECT DESCRIPTION | LOCAL PORTION OF PROJECT [A] | % OF PROJECT ASSOCIATED WITH NEW CAPACITY [B] | IMPACT FEE PORTION OF LOCAL PORTION [C=A*B] |
|---|---|---|---|
| **Main Street Reconstruction**<br>Introducing bike lanes to US 2/7 as well as reconstructing vehicle lanes and sidewalks. | $5,300,000 | 27% | $1,458,000 |
| **East Allen Street Project**<br>Reconstruct the travel lanes, replace a 5-ft. sidewalk on north side and a new 12-ft. shared-use path on the south side of the project. | $1,600,000 | 19% | $301,000 |
| **Sidewalks**<br>New 5-ft. wide concrete sidewalks<br>• East Spring (East Allen to Russell St.)<br>• North Street (Pine St. to Cedar St.) | $777,070 | 100% | $777,070 |
| **Total Projects** | **$9,377,070** | **–** | **$2,536,070** |

Table 6 shows estimated capacities, regardless of demand, for specific types of facilities. These data inform how changing space from one mode to another can increase the overall capacity of the transportation system. For example, on East Allen Street there is a net increase in capacity by replacing a 5-foot sidewalk with a 12-foot shared-use path. Likewise, adding bike facilities, even sharrows, can increase the capacity of the road by providing users additional delineated space and improved experience.

**TABLE 6: IMPACT FEE PROJECTS CHANGE IN CAPACITY**

| INFRASTRUCTURE | LENGTH (MILES) | POINT CAPACITY (PERSONS PER HR) |
|---|---|---|
| **Main Street Project** | | |
| Buffered Bike Lanes | 0.75 | 1,200 |
| Bike Lanes (Tigan Street) | 0.08 | 800 |
| Sharrows | 0.75 | 150 |
| | *Change in Capacity* | *2,150* |
| **East Allen Street Project** | | |
| 5-ft. Sidewalk (to be removed) | 0.5 | -880 |
| 12-ft. Shared-Use Path (south side) to Replace the Sidewalk | 0.5 | 1,500 |
| | *Change in Capacity* | *620* |
| **New Sidewalks** | | |
| 5-ft. Sidewalks | 0.5 | 880 |
| | *Change in Capacity* | *880* |

The total change in capacity associated with the impact fee projects is 3,650 persons per hour.

## 5.1 STANDARD OF SERVICE TESTS

A fundamental tenet of impact fees is that the growth and development does not pay for more than their proportion of impact, or their “fair share” of the mitigating capacity improvements. This can be evaluated by comparing the current standard of service to the standard of service with and without the impact fee projects. This test uses two methodologies:

1. Ratio expansion of capacity.
2. Person capacity.

### Ratio Expansion of Capacity

The city of Winooski has a dense transportation network providing access throughout the small 1.5-square-mile area. Excluding I-89, there are 35.9 lane miles of roads, 18.75 miles of sidewalk, 0.15 miles of bike lanes, and 1.73 miles of shared-use paths.

The existing supply of transportation infrastructure within the city of Winooski is summarized in Table 7. GIS data and aerial imagery were used to calculate the supply. The existing number of households and employees were used to develop a ratio of **users per mile of infrastructure**. A ratio per user was used that combined households and one-half of the employees. This attempts to capture the relative benefits that the users derive from the infrastructure. This assumes that residents can use the capacity 24 hours each day, whereas the employees would be a portion of the day.

**TABLE 7: EXISTING SUPPLY OF TRANSPORTATION FACILITIES**

| FACILITY TYPE | MILES [A] | RATIO: MILES PER HH [B] | RATIO: MILES PER EMPLOYEE [C] | RATIO: MILES PER USER [D] |
|---|---|---|---|---|
| Road Lane (1 Lane) | 35.92 | 10.87 | 8.98 | 6.77 |
| Sidewalk (5 ft. Wide) | 18.75 | 5.68 | 4.69 | 3.54 |
| Bike Lanes | 0.15 | 0.05 | 0.04 | 0.03 |
| Shared-Use Path | 1.73 | 0.52 | 0.43 | 0.33 |

The ratio of users per mile of infrastructure is used to calculate the supply (miles) of new vehicle lanes, bike lanes, and shared-use paths by 2040. The supply necessary to maintain the current ratios (miles per unit of growth) is shown next to the supply being provided in the impact fee projects.

**TABLE 8: RATIO EXPANSION OF CAPACITY**

| FACILITY TYPE | CHANGE IN USERS (1000S) 2040 [A] | RATIO USED: MILES PER USER [B] | CHANGE IN MILES DUE TO CHANGE IN USERS [C] | MILES OF IMPACT FEE PROJECTS [D] |
|---|---|---|---|---|
| Road Lane (1 Lane) | 1.163 | 6.77 | 7.88 | 0.00 |
| Sidewalk (5 ft. Wide) | 1.163 | 3.54 | 4.11 | 0.00 |
| Bike Lanes | 1.163 | 0.03 | 0.03 | 0.83 |
| Shared-Use Path | 1.163 | 0.33 | 0.38 | 0.50 |

Table 8 shows high number of lane miles suggested by the current ratio of lane miles to unit of growth, especially compared to the number of lane miles planned in the impact fee projects (column D).

The ratio-based capacity expansion retains the existing proportions as new land-use development increases demand on the system.

If the future projects were only based on a ratio approach, it simply extrapolates the existing supply, and does not support policy objectives to build the most efficient system and maximize the full capacity of the system. Other approaches can better translate capacity from one mode to another.

## Person Capacity

Vermont's Complete Street legislation in 2011 directed that all users of the transportation system (regardless of mode) are considered in all state and municipally managed transportation projects. The recognition that all users of the system are equally valued in the development of projects provides the context for developing a mode-agnostic person miles capacity analysis of the transportation system in Winooski.

This approach of comparing modal capacity uses a point capacity of the specific mode multiplied by the length of the facility. In doing so, it attempts to capture the total capacity of the

system. In 2015, there was 51,109 persons per hour capacity in the city (Table 9). The same denominator from above, users (which equals the number of household and one-half of the employees), is used to develop the total system capacity per user.

**TABLE 9: 2015 POINT CAPACITY**

| FACILITY | MILES [A] | CAPACITY (PER HR) [B] | CAPACITY OF SYSTEM (PERSON MILES PER HR) [C] |
|---|---|---|---|
| Road Lane (1 Lane) | 35.92 | 900 | 32,328 |
| Sidewalk (5 ft. Wide) | 18.75 | 880 | 16,500 |
| Bike Lanes | 0.15 | 800 | 121 |
| Shared-Use Path (10 ft.) | 1.73 | 1,250 | 2,160 |
| | | **Total Capacity of System** | **51,109** |

The comparison to 2040 shows the deterioration in capacity per user and how much additional capacity (11,209 persons per hour) should be necessary to maintain the current standards of service (capacity per user) in row [G].

**TABLE 10: 2040 CAPACITY REQUIREMENTS VS. 2015 CAPACITY**

| | |
|---|---|
| 2015 Capacity **[A]** | 51,109 person miles capacity per PM peak hour |
| 2015 Users (000s) **[B]** | 5.303 (number of households + one-half number of employees) |
| 2015 Service Standard: 2015 Capacity / Users **[C]** | 9,638 person miles capacity per user |
| 2040 Users (000s) **[D]** | 6.466 (number of households + one-half number of employees) |
| 2015 Capacity / 2040 Users **[E]** | 7,904 person miles capacity per user if the system is not expanded |
| Capacity Required to Maintain 2015 Standards **[F]** | **[D]** x **[C]**<br>(6.466) x (9,638) = 62,318 person miles capacity |
| Change in Capacity to Maintain Standards **[G]** | [F] – [A]<br>62,318 – 51,109 = 11,209 |
| New Capacity Funded by Impact Fees **[H]** | 3,650 person miles capacity from Table 6 |
| 2040 Service Standard: 2040 Capacity / 2040 Users **[I]** | **[A]**+**[H]** / **[D]**<br>54,759 / 6.466 = 8,469 |

Table 10 indicates that the standard of service test is met and the following is true:

- The existing experience within the city of Winooski deteriorates due to future growth and land-use development. In the absence of the impact fee projects the standard (capacity to users) ratio falls from 9,638 [C] to 7,904 [E].
- The fee projects funded by impact fees levied on future growth and land-use development do not improve conditions above what is experienced today. Adding the new capacity to the existing capacity would result in a slight deterioration of overall standards of service (capacity to users) ratio of 9,638 [C] to 8,469 [I].

## 5.2 TRAVEL CHARACTERISTICS

The travel demand model accounts for all trips, but only assigns vehicle trips to the network. A review of these trips allows for an estimation for the potential for some vehicle trips to shift to active modes with the improvements identified by the city of Winooski. This review provides another perspective on whether the types of projects have sufficient demand given the scale and density of the land use in and around Winooski.

The improvement in bike lanes and shared-use paths should increase biking trips, thereby freeing up road space for those who may need to drive for longer distances. Recent research suggests that e-bikes used for utilitarian trips (rather than recreational) end up replacing vehicle trips. The trip length also suggests that e-bikes are now being used on average of 9.3 miles for the trips replacing automobiles. The research has been focused on e-bikes and the changes that they encourage throughout the network.[12]

[12] National Institute for Transportation and Communities. “A North American Survey of Electric Bicycle Owners.” March 2018. Available at: https://www.calbike.org/wp-content/uploads/2019/02/A-North-American-Survey-of-Electric-Bicycle-Owners.pdf.

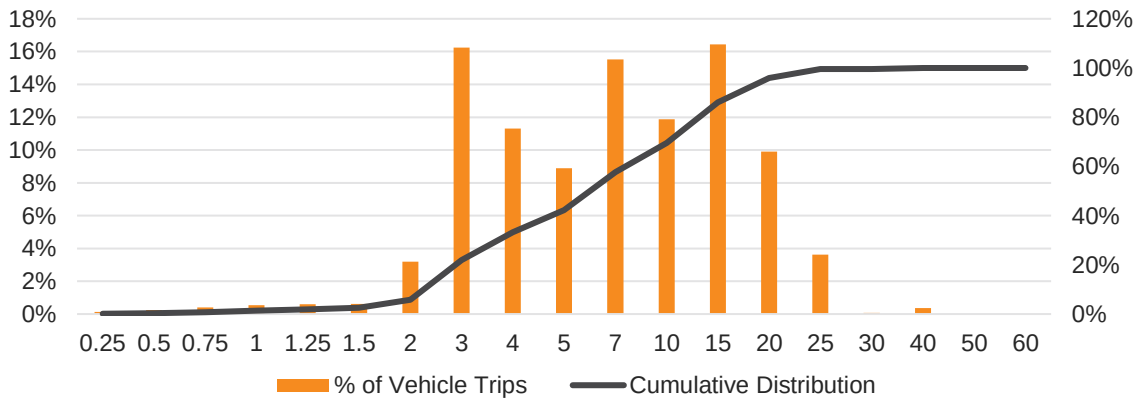
Table 11 shows the breakdown of vehicle trips for 2015 and 2040. The data indicate that by 2040, around 2,400 vehicle trips are 10 miles or less that have an origin or destination in Winooski during the PM peak hour.

**TABLE 11: VEHICLE TRIP LENGTH DISTRIBUTION IN WINOOSKI**

| TRIP LENGTH | 2015 PM TRIPS-CUMULATIVE | 2040 PM TRIPS-CUMULATIVE |
|---|---|---|
| 0.25 | 4 | 4 |
| 0.5 | 12 | 13 |
| 0.75 | 25 | 27 |
| 1 | 42 | 46 |
| 1.25 | 61 | 67 |
| 1.5 | 80 | 89 |
| 2 | 178 | 201 |
| 3 | 671 | 771 |
| 4 | 1,014 | 1,168 |
| 5 | 1,293 | 1,480 |
| 7 | 1,756 | 2,024 |
| 10 | 2,118 | 2,441 |
| 15 | 2,620 | 3,018 |
| 20 | 2,920 | 3,365 |
| 25 | 3,029 | 3,492 |
| 30 | 3,032 | 3,495 |
| 40 | 3,044 | 3,508 |

The number of existing vehicle trips that are less than 10 miles (~70% of trips) in length suggest with improved bicycle facilities there can be a significant shift of vehicle trips to bicycle trips. Figure 6 shows the distribution of vehicle trip lengths. This analysis supports other regional initiatives to improve regional connectivity for bike trips between each of the major centers within Chittenden County.

**FIGURE 6: VEHICLE TRIP LENGTH DISTRIBUTION (2040 VEHICLE TRIPS)**




*Source: CCRPC Travel Model analysis by RSG*

# 6.0 BASE IMPACT FEE

Base impact fees are the raw, unadjusted fees that are later discounted for credits and other incentives. The fee will be charged on a PM peak hour per trip basis, consistent with other communities in Vermont and the Vermont Agency of Transportation's statewide impact fee enabling legislation, per Act 145 of 2014-Transportation Impact Fees (10 VSA Sections 6101-6111).[13]

The base fee is described by the following equation:

**Impact Fee = (Cost per PM Peak Hour Trip x New PM Peak Hour trips) – (Applicable Credits)**

This represents cost of projects divided by the number of new trips during the PM peak hour as shown in Table 12.

**TABLE 12: IMPACT FEE PER PM PEAK HOUR TRIP**

| | |
|---|---|
| Cost of Impact Fee Projects (Table 5) | $2,536,070 |
| Number of new PM Peak Hour Trips (Figure 5) | 2,062 |
| **Cost per PM Peak Hour Trip (Eligible Project Costs / New Trips)** | **$1,229.91** |

These fees would be assessed on any primary trips generated by a land-use change that increases trip generation from a previous use, regardless of mode.

The City can direct applicants to use a simplified land-use trip generation table to estimate the number of primary PM peak hours that would be generated. Alternatively, a trip generation study could be conducted to independently determine primary trips, which would estimate total trips and subtract pass-by trips.

## Estimated Impact Fee Revenue

The city of Winooski's impact fee is based on the total number of new PM peak hour trips that will consume transportation capacity. Not all new trips are associated with changes in land-use development. Approximately 878 of the new 2,062 trips (42.6%) are associated with trips that neither originate nor are destinated for points in Winooski. These trips' consuming capacity is part of the growth that is being accommodated and the fee is based on the total growth. However, the City can only collect revenue based on the number of those trips generated by local land development.

[13] Act 145 – 10 VSA §6104.

The cost and responsibility of delivering the infrastructure capacity remains. Therefore, the City is required to find additional non-impact-fee revenues to cover the portion of the project that will not be paid by the through trips.

The two projects, Main Street and East Allen Street, directly connect to other adjacent communities and would serve these through trips. Column D in Table 13 shows how much funding needs to be allocated by other sources to cover the through traffic.

The property tax has been identified by the City to cover the gap funding source. Therefore, a credit is necessary to offset the amount an applicant paying an impact fee would also pay in property taxes that would fund the same capacity.

Table 13 shows the total project costs (Col [A]), the portion of the project unrelated to capacity increases (Col [B]), the cost of new capacity (Col [C]), the share of capacity associated with external demand (Col [D]), and local demand (Col [E]).

**TABLE 13: IMPACT FEE PROJECT FUNDING GAP**

| PROJECT | TOTAL PROJECT COST | NON-IMPACT-FEE ELIGIBLE PROJECT COST | IMPACT-FEE-ELIGIBLE PORTION | | |
|---|---|---|---|---|---|
| | | NON-CAPACITY-RELATED PROJECT COSTS | CAPACITY INCREASE PORTION OF PROJECT | SHARE OF CAPACITY ASSOCIATED WITH EXTERNAL DEMAND | SHARE OF CAPACITY ASSOCIATED WITH LOCAL DEMAND |
| | [A] | [B] | [C] | [D] | [E] |
| Main Street | $5,300,000 | $3,842,000 | $1,458,000 | $620,817 | $837,183 |
| East Allen Street | $1,600,000 | $1,299,000 | $301,000 | $128,166 | $172,834 |
| Sidewalks (East Spring & North Street) | $777,070 | – | $777,070 | – | $777,070 |
| **Total** | **$7,677,070** | **$5,141,000** | **$2,536,070** | **$748,983** | **$1,787,087** |

Table 13 shows that local land-use development is expected to contribute approximately $1.8 million toward the $7.68 million in transportation projects identified as eligible for impact fee contributions by 2040.

## 6.2 CREDITS

Credits are adjustments to the base impact fee that a land use would be assessed. Two credits are used to offset impact fees: infrastructure credit and revenue credits. The credits are applied after the base impact fee is calculated, as per equation:

**Impact Fee = (Cost per PM Peak Hour Trip x New PM Peak Hour trips) – (Applicable Credits)**

## Infrastructure Credits

A land-use development applicant that constructs any of the projects identified in Table 5 is eligible for a reduction in impact fees, up to the total amount of the impact fee liability. If the cost of the project exceeds the impact fee liability, the City has the latitude to allow that credit to offset future impact fees imposed on the entity that constructed the infrastructure project. The credit is also applicable even if the project was a condition of the land-use development during the review process. This reduces the perception of double payments and incentivizes development in areas identified for transportation infrastructure.

## Revenue Credits

Revenue credits discount the base impact fee to reduce the chance that a land-use development in the city would be funding the same capital improvement through two different funds. This frequently occurs when the developer pays property taxes (prior to the development of the land and after the development) and a portion of which goes to fund the capital project that the impact fee contributed toward. In this case, it is necessary to offset the impact fee by a credit value to eliminate the double payment toward the same capacity. The credits equal the discounted present value of the stream of tax payments used for those expenditures.

As summarized in Table 13 Column [D], $748,983 of funds are required to cover the portion of the impact-fee-eligible portion of the projects. It is expected these funds will come from property taxes. Roughly, this equates to a property tax burden of $37,450 per year from 2020 to 2040.

The stream of tax payments is broken into two parts: that which occurs before the land-use development occurs (called **past tax payments**), and that which occurs after the development comes onto the grand list (called **future tax payments**). The past tax payment determines the amount of tax payments on the raw or previously developed land made prior to the payment of the impact fee. The future tax payment accounts for the stream of future tax payments made on the new development after the impact fee was paid.

The property tax valuations on residential and nonresidential are different enough to warrant two mechanisms to calculate the credit.

The residential credit is based on the unit of bedrooms. Since the base fee varies on the intensity of demand based on the number of bedrooms, the credit is derived to align with a per-bedroom approach.

The 2019 grand list was analyzed and a per residential value was established at $2,040 valuation (1% of property value or the assessed value / 100 is used to set the tax rate). The current ACS data indicate that there are an average of 2.1 bedrooms per residential unit within Winooski (see Table 1). Dividing the taxable value of a residential unit by the bedroom count

results in a taxable value of $971 per bedroom or, $97,100 per bedroom in assessed dollars. The total grand list in 2019 is $5,712,469.

The City has confirmed that the past 10 years have seen an average growth in the grand list under 1% per year. This study assumes a 0.8% annual growth rate in the grand list for the duration of this impact fee. A discount rate of 3% is also assumed for the duration of this study.

Using these assumptions, it is possible to calculate what equivalent tax rate is assessed on a unit of development to cover the $37,450 property taxes needed to fund the portion of the impact fee projects associated with external, nonlocal growth.

## Residential Development

### *Past Tax Payments*

The past tax payment credit is derived from the value of the predevelopment tax payments for any given residential development. For example, a dwelling constructed in 2025 includes tax payments made in years 2020 through 2024 that are used to fund this capacity. This stream of payments is converted to the net present value in the year of construction by using a discount rate of 3%. Table 14 summarizes the value of predevelopment credits for a bedroom.

**TABLE 14: RESIDENTIAL REVENUE CREDIT FOR PREDEVELOPMENT TAX PAYMENTS**

| DWELLING YEAR | ANNUAL EXPENSE | TAX RATE NEEDED | TAX PER BEDROOM | NET PRESENT VALUE OF CREDIT |
|---|---|---|---|---|
| 2020 | $37,450 | 0.006504 | $6.32 | $0.00 |
| 2021 | $37,450 | 0.006452 | $6.27 | $6.51 |
| 2022 | $37,450 | 0.006401 | $6.22 | $13.16 |
| 2023 | $37,450 | 0.006350 | $6.17 | $19.96 |
| 2024 | $37,450 | 0.006300 | $6.12 | $26.91 |
| 2025 | $37,450 | 0.006250 | $6.07 | $34.02 |
| 2026 | $37,450 | 0.006200 | $6.02 | $41.30 |
| 2027 | $37,450 | 0.006151 | $5.98 | $48.74 |
| 2028 | $37,450 | 0.006102 | $5.93 | $56.35 |
| 2029 | $37,450 | 0.006054 | $5.88 | $64.15 |
| 2030 | $37,450 | 0.006006 | $5.83 | $72.13 |
| 2031 | $37,450 | 0.005958 | $5.79 | $80.31 |
| 2032 | $37,450 | 0.005911 | $5.74 | $88.68 |
| 2033 | $37,450 | 0.005864 | $5.70 | $97.25 |
| 2034 | $37,450 | 0.005817 | $5.65 | $106.04 |
| 2035 | $37,450 | 0.005771 | $5.61 | $115.04 |
| 2036 | $37,450 | 0.005725 | $5.56 | $124.26 |
| 2037 | $37,450 | 0.005680 | $5.52 | $133.72 |
| 2038 | $37,450 | 0.005680 | $5.52 | $143.41 |
| 2039 | $37,450 | 0.005635 | $5.47 | $153.40 |
| 2040 | $37,450 | 0.005590 | $5.43 | $163.64 |

Once the dwelling is constructed, or redeveloped in many of the situations within Winooski, it pays annual taxes on its new value. Only residential structures that increase the bedroom count are assessed impact fees.

Table 15 identifies the annual payments for future years from when the dwelling comes onto the grand list through the end of the programmed expenditures (2040). The credit for the tax payment is the current value of the future stream of tax payments, assuming a discount rate of 3%.

**TABLE 15: RESIDENTIAL REVENUE CREDIT FOR FUTURE DEVELOPMENT TAX PAYMENTS**

| DWELLING YEAR | ANNUAL EXPENSE | TAX RATE NEEDED | TAX PAID | NET PRESENT VALUE OF CREDIT |
|---|---|---|---|---|
| 2020 | $37,450 | 0.006504 | $6.32 | $90.81 |
| 2021 | $37,450 | 0.006452 | $6.27 | $87.22 |
| 2022 | $37,450 | 0.006401 | $6.22 | $83.57 |
| 2023 | $37,450 | 0.006350 | $6.17 | $79.85 |
| 2024 | $37,450 | 0.006300 | $6.12 | $76.08 |
| 2025 | $37,450 | 0.006250 | $6.07 | $72.24 |
| 2026 | $37,450 | 0.006200 | $6.02 | $68.34 |
| 2027 | $37,450 | 0.006151 | $5.98 | $64.37 |
| 2028 | $37,450 | 0.006102 | $5.93 | $60.32 |
| 2029 | $37,450 | 0.006054 | $5.88 | $56.21 |
| 2030 | $37,450 | 0.006006 | $5.83 | $52.01 |
| 2031 | $37,450 | 0.005958 | $5.79 | $47.74 |
| 2032 | $37,450 | 0.005911 | $5.74 | $43.38 |
| 2033 | $37,450 | 0.005864 | $5.70 | $38.94 |
| 2034 | $37,450 | 0.005817 | $5.65 | $34.41 |
| 2035 | $37,450 | 0.005771 | $5.61 | $29.79 |
| 2036 | $37,450 | 0.005725 | $5.56 | $25.08 |
| 2037 | $37,450 | 0.005680 | $5.52 | $20.27 |
| 2038 | $37,450 | 0.005635 | $5.47 | $15.36 |
| 2039 | $37,450 | 0.005590 | $5.43 | $10.35 |
| 2040 | $37,450 | 0.005546 | $5.39 | $5.23 |

## Nonresidential Development

The value of impact fee credits for the nonresidential development is split into two categories: predevelopment and postdevelopment. Given the variety of nonresidential construction types, locations, and overall variation in the value that nonresidential land uses have within the grand list, the credit mechanism is based not on an average property value, but on a unit of $1,000 property market value. This estimate is often part of any land-use application.

The predevelopment credit is to be calculated on the assessed value (not grand list value) of the land on which the development has occurred or will occur. This requires some judgment in terms of how a fractional use of a parcel is defined for the value of the nonresidential development. For instance, a five-acre parcel could be 20% for each one-acre subdivision; or,

due to concentration within the five acres, the limited development footprint may be closer to 40%.

**TABLE 16: NONRESIDENTIAL REVENUE CREDIT FOR PREDEVELOPMENT TAX PAYMENTS**

| DWELLING YEAR | ANNUAL EXPENSE | TAX RATE NEEDED | TAX ON $1,000 OF VALUE | CREDITS PER $1,000 OF ASSESSED VALUE |
|---|---|---|---|---|
| 2020 | $37,450 | 0.006556 | $0.07 | $0.00 |
| 2021 | $37,450 | 0.006504 | $0.07 | $0.07 |
| 2022 | $37,450 | 0.006452 | $0.06 | $0.14 |
| 2023 | $37,450 | 0.006401 | $0.06 | $0.21 |
| 2024 | $37,450 | 0.006350 | $0.06 | $0.28 |
| 2025 | $37,450 | 0.006300 | $0.06 | $0.35 |
| 2026 | $37,450 | 0.006250 | $0.06 | $0.43 |
| 2027 | $37,450 | 0.006200 | $0.06 | $0.51 |
| 2028 | $37,450 | 0.006151 | $0.06 | $0.58 |
| 2029 | $37,450 | 0.006102 | $0.06 | $0.67 |
| 2030 | $37,450 | 0.006054 | $0.06 | $0.75 |
| 2031 | $37,450 | 0.006006 | $0.06 | $0.83 |
| 2032 | $37,450 | 0.005958 | $0.06 | $0.92 |
| 2033 | $37,450 | 0.005911 | $0.06 | $1.01 |
| 2034 | $37,450 | 0.005864 | $0.06 | $1.10 |
| 2035 | $37,450 | 0.005817 | $0.06 | $1.19 |
| 2036 | $37,450 | 0.005771 | $0.06 | $1.29 |
| 2037 | $37,450 | 0.005725 | $0.06 | $1.39 |
| 2038 | $37,450 | 0.005680 | $0.06 | $1.49 |
| 2039 | $37,450 | 0.005635 | $0.06 | $1.59 |
| 2040 | $37,450 | 0.005590 | $0.06 | $1.70 |

The postdevelopment credit is calculated based on the development value of the *structure*, which also uses $1,000 units of value. The credit is developed as a value per $1,000 of development value. The development value is often included in local development permits and State Act 250 applications. Table 17 assists in the estimation of development property assessment values based on different construction methods, building types, and uses. The study team created the table using an online subscription to RSMeans Square Foot Cost Estimator, which is available for the Burlington, Vermont, metropolitan area based on 2017 Q2 data. The estimates include general contractor and architectural fees, basic site work elements, and structural building elements. Four generalized types and typical forms of construction often found here in Vermont are included in this analysis. The 2017 data were escalated to 2020 values using the Engineering News Record CCI (Construction Cost Index).[14]

[14] Engineering News-Record: http://enr.construction.com/economics/default.asp.

**TABLE 17: 2020 CONSTRUCTION VALUES FOR NONRESIDENTIAL USES BY CONSTRUCTION TYPE (VALUE PER SQUARE FOOT)**

| CONSTRUCTION TYPE | REINFORCED CONCRETE OR STEEL FRAME | MASONRY OR CONCRETE BEARING WALL | WOOD FRAME | PREFAB. STEEL |
|---|---|---|---|---|
| Accommodation (hotels, shared and group housing) | $202 | $196 | $157 | $194 |
| Commercial (office, professional) | $233 | $219 | $185 | $188 |
| Industrial/factory/warehouse | $147 | $134 | $0 | $107 |
| Educational (K–12) | $197 | $199 | $0 | $167 |
| Retail | $156 | $168 | $119 | $128 |

**TABLE 18: NONRESIDENTIAL REVENUE CREDIT FOR FUTURE DEVELOPMENT TAX PAYMENTS**

| DWELLING YEAR | ANNUAL EXPENSE | TAX RATE NEEDED | TAX ON $1,000 OF VALUE | CREDITS PER $1,000 OF ASSESSED VALUE |
|---|---|---|---|---|
| 2020 | $37,450 | 0.006556 | $0.07 | $0.94 |
| 2021 | $37,450 | 0.006504 | $0.07 | $0.91 |
| 2022 | $37,450 | 0.006452 | $0.06 | $0.87 |
| 2023 | $37,450 | 0.006401 | $0.06 | $0.83 |
| 2024 | $37,450 | 0.006350 | $0.06 | $0.79 |
| 2025 | $37,450 | 0.006300 | $0.06 | $0.75 |
| 2026 | $37,450 | 0.006250 | $0.06 | $0.71 |
| 2027 | $37,450 | 0.006200 | $0.06 | $0.67 |
| 2028 | $37,450 | 0.006151 | $0.06 | $0.63 |
| 2029 | $37,450 | 0.006102 | $0.06 | $0.58 |
| 2030 | $37,450 | 0.006054 | $0.06 | $0.54 |
| 2031 | $37,450 | 0.006006 | $0.06 | $0.50 |
| 2032 | $37,450 | 0.005958 | $0.06 | $0.45 |
| 2033 | $37,450 | 0.005911 | $0.06 | $0.40 |
| 2034 | $37,450 | 0.005864 | $0.06 | $0.36 |
| 2035 | $37,450 | 0.005817 | $0.06 | $0.31 |
| 2036 | $37,450 | 0.005771 | $0.06 | $0.26 |
| 2037 | $37,450 | 0.005725 | $0.06 | $0.21 |
| 2038 | $37,450 | 0.005680 | $0.06 | $0.16 |
| 2039 | $37,450 | 0.005635 | $0.06 | $0.11 |
| 2040 | $37,450 | 0.005590 | $0.06 | $0.05 |

## 6.3 NONRESIDENTIAL FEES

The nonresidential land uses do not have the benefit of a summary document like this given the variety of construction methods and postconstruction values. The steps for nonresidential impact fees are as follows:

1. Calculate the number of new trips generated during the PM peak hour.
2. Multiply the number of trips by the cost per trip $1,229.91 (Table 12) to obtain the base impact fee.
3. Determine predevelopment revenue credits based on the year of development and value of the property (Table 16). Multiply the credit value by assessed value and divide by $1,000.
4. Determine the postdevelopment revenue credits based on the year of development and value of the development (Table 18). Multiply the credit by the assessed value of the new construction and divide by $1,000.
5. Calculate the final impact fee using Step 2 and subtract Step 3 and Step 4.

## 6.4 FEE PER RESIDENTIAL UNIT

The residential land uses in the city are assessed on the degree of transportation demand generated. Rather than combine the residential uses into single family and multifamily, commonly used in ITE Trip Generation, the study team estimated a specific trip generation per bedroom using data from the 2019 American Housing Survey (AHS) and the 2017 National Household Travel Survey (NHTS) data. The two sources were combined to generate a model that estimates trips using income and bedrooms as inputs. Bedroom count was identified by the City as the preferred input for use within the impact fee process. Among the data used, there was an average of 2.14 bedrooms that generate 0.92 peak hour trips.

See Appendix C for the linear model regression and the inputs from the data sources.

**TABLE 19: BASE FEE PER RESIDENTIAL UNIT BASED ON BEDROOMS**

| BEDROOM COUNT | COST PER TRIP | TRIP GENERATION DURING PM PEAK HOUR | BASE FEE PER UNIT |
|---|---|---|---|
| Residential (0 bedrooms) | $1,229.91 | 0.69 | $848.64 |
| Residential (1 bedroom) | $1,229.91 | 0.80 | $983.93 |
| Residential (2 bedrooms) | $1,229.91 | 0.91 | $1,119.22 |
| Residential (3 bedrooms) | $1,229.91 | 1.02 | $1,254.51 |
| Residential (4+ bedrooms) | $1,229.91 | 1.12 | $1,377.50 |

If a residential project is built with multiple 2, 3, or 4+ units, then the project could take the average trips generated per bedroom for each of the unit types to calculate the fee. Table 20 shows the fee per bedroom.

**TABLE 20: BASE IMPACT FEE PER BEDROOM FOR MULTIPLE BEDROOM UNITS**

| BEDROOM COUNT | COST PER TRIP | TRIP GENERATION DURING PM PEAK HOUR | BASE FEE PER UNIT | PM PEAK HOUR TRIPS PER BEDROOM | BASE IMPACT FEE PER BEDROOM |
|---|---|---|---|---|---|
| Residential (2 bedrooms) | $1,229.91 | 0.91 | $1,119.22 | 0.46 | $559.61 |
| Residential (3 bedrooms) | $1,229.91 | 1.02 | $1,254.51 | 0.34 | $418.17 |
| Residential (4+ bedrooms) | $1,229.91 | 1.12 | $1,377.50 | 0.28 | $344.38 |

The credit can be applied for a residential unit based on the number of bedrooms or using the credit per bedroom and the base impact fee per bedroom given the type of unit.

Table 21 shows the total credit per bedroom and net impact fee per unit based on the number of bedrooms. The net fee per unit is derived by subtracting the total credit per unit (credit per bedroom x number of bedrooms) from the base impact fee per unit.

*Example, a 4 bedroom net fee equals $1,377.52 if it were constructed in 2020.*

= total credit for a 4 bedroom in 2020 ($90.81 x 4 = $363.24)

= base impact fee for a 4 bedroom =$1,377.50

= net impact fee for a 4 bedroom in 2020 = $1,377.50 - $363.24

= $1,014.26

**TABLE 21: NET RESIDENTIAL IMPACT FEES FOR TRANSPORTATION CAPITAL EXPENSES**

| DWELLING YEAR | CREDITS | | | NET FEE PER UNIT BASED ON BEDROOM COUNT | | | | |
|---|---|---|---|---|---|---|---|---|
| | Credit for Past Taxes | Credit for Future Taxes | Total Credit per Bedroom | 0 | 1 | 2 | 3 | 4 |
| 2020 | $0.00 | $90.81 | $90.81 | $757.83 | $893.12 | $937.60 | $982.08 | $1,014.26 |
| 2021 | $6.51 | $87.22 | $93.72 | $754.92 | $890.21 | $931.78 | $973.35 | $1,002.62 |
| 2022 | $13.16 | $83.57 | $96.72 | $751.92 | $887.21 | $925.78 | $964.35 | $990.62 |
| 2023 | $19.96 | $79.85 | $99.81 | $748.83 | $884.12 | $919.60 | $955.08 | $978.26 |
| 2024 | $26.91 | $76.08 | $102.99 | $745.65 | $880.94 | $913.24 | $945.54 | $965.54 |
| 2025 | $34.02 | $72.24 | $106.27 | $742.37 | $877.66 | $906.68 | $935.70 | $952.42 |
| 2026 | $41.30 | $68.34 | $109.64 | $739.00 | $874.29 | $899.94 | $925.59 | $938.94 |
| 2027 | $48.74 | $64.37 | $113.11 | $735.53 | $870.82 | $893.00 | $915.18 | $925.06 |
| 2028 | $56.35 | $60.32 | $116.68 | $731.96 | $867.25 | $885.86 | $904.47 | $910.78 |
| 2029 | $64.15 | $56.21 | $120.36 | $728.28 | $863.57 | $878.50 | $893.43 | $896.06 |
| 2030 | $72.13 | $52.01 | $124.14 | $724.50 | $859.79 | $870.94 | $882.09 | $880.94 |
| 2031 | $80.31 | $47.74 | $128.04 | $720.60 | $855.89 | $863.14 | $870.39 | $865.34 |
| 2032 | $88.68 | $43.38 | $132.06 | $716.58 | $851.87 | $855.10 | $858.33 | $849.26 |
| 2033 | $97.25 | $38.94 | $136.19 | $712.45 | $847.74 | $846.84 | $845.94 | $832.74 |
| 2034 | $106.04 | $34.41 | $140.45 | $708.19 | $843.48 | $838.32 | $833.16 | $815.70 |
| 2035 | $115.04 | $29.79 | $144.83 | $703.81 | $839.10 | $829.56 | $820.02 | $798.18 |
| 2036 | $124.26 | $25.08 | $149.34 | $699.30 | $834.59 | $820.54 | $806.49 | $780.14 |
| 2037 | $133.72 | $20.27 | $153.99 | $694.65 | $829.94 | $811.24 | $792.54 | $761.54 |
| 2038 | $143.41 | $15.36 | $158.78 | $689.86 | $825.15 | $801.66 | $778.17 | $742.38 |
| 2039 | $153.40 | $10.35 | $163.75 | $684.89 | $820.18 | $791.72 | $763.26 | $722.50 |
| 2040 | $163.64 | $5.23 | $168.87 | $679.77 | $815.06 | $781.48 | $747.90 | $702.02 |

# APPENDIX A. CAPACITY OF INFRASTRUCTURE

**TABLE 22: PERSON MILES CAPACITY PER MILE**

| TYPE OF FACILITY | PERSON CAPACITY15 (TARGET V/C RATIO ~.5) |
|---|---|
| Bicycle Boulevard/cycle track | 1,400 |
| Sharrows | 150 |
| Bike Lanes | 800 |
| Buffered Bike Lanes | 1,200 |
| Paved Shoulder | 200 |
| Protected Bike Lane | 1,320 |
| Shared-Use Path (10 foot wide) | 1,250 |
| Road lane (1 lanes) | 900 |
| Sidewalk (5 feet wide) | 880 |
| Sidewalk (10 feet wide) | 1,760 |

**TABLE 23: PERCENT NEW CAPACITY FOR THE IMPACT FEE PROJECTS**

| INFRASTRUCTURE | POINT CAPACITY (PERSONS PER HR) | % OF NEW CAPACITY IN PROJECT |
|---|---|---|
| **Main Street Project** | | |
| Road | 1,800 | – |
| Bike (sharrows & buffered bike lane) | 1,350 | 27.5% |
| Sidewalk | 1,760 | – |
| *Subtotal Capacity* | *4,910* | – |
| **East Allen Street** | | |
| Road | 1,800 | – |
| Bike (shared-use path) | 1,500 | 18.8% |
| Previous Sidewalk | -880 | – |
| Sidewalk | 880 | – |
| *Subtotal Capacity* | *3,300* | – |

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# APPENDIX B. CITY OF WINOOSKI TRANSPORTATION MASTER PLAN PROJECTS

**TABLE 24: MASTER PLAN PROJECT LIST**

| PROJECT ID # | PROJECT | TYPE | ESTIMATED IMPLEMENTATION TIMEFRAME | NEXT STEP | CONSTRUCTION COST ESTIMATE | PRIORITY |
|---|---|---|---|---|---|---|
| 1 | **Winooski River Bridge Bicycle Accommodations** Provide a safe bicycle connection across the Winooski River Bridge that connects to Colchester Avenue and multiuse path on Riverside Avenue | Bicycle | Long-Term | Scoping Study (currently in FY 16-17 CCRPC UPWP) | $3,000,000 | High |
| 28 | **Main Street Gateway Enhancements** Implement improvements along Main Street to enhance gateway aesthetic, pedestrian accessibility, traffic safety, etc. | Roadway/ Streetscape | Midterm | Define first segment to advance to conceptual design | Varies depending on identified improvements | High |
| 29 | **Malletts Bay Avenue Gateway Enhancements** Evaluate potential gateway, safety, and streetscape enhancements in concert with potential plans for relocation of City Hall to the O'Brien Community Center Lot | Roadway/ Streetscape | Midterm | Scoping/Corridor Study (submit for FY 17-18 CCRPC UPWP) | Varies depending on identified improvements | High |
| 30 | **Expand Public Transit Service in Winooski** Work collaboratively with the GMT to evaluate potential enhancements to the existing service | Transit | Short-Term/Midterm | Coordination with GMT upcoming system-wide planning efforts | Varies depending on outcome of transit study | High |
| 24/25/34 | **Evaluate Parking in Downtown/CBD** Evaluate overall parking system as well as potential new/expanded parking supply at the Woolen Mill and the St. Stephen Church Parking Lot | Parking | Midterm | Conduct Downtown Parking Management Plan (in process) | Varies depending on findings | High |
| 27 | **East Allen Street Gateway Enhancements** Evaluate opportunities to enhance safety, accessibility for walkers and cyclists, and enhance the aesthetics of this key gateway into Winooski | Roadway/ Streetscape | Midterm/Long-Term | Scoping/Corridor Study (submit for FY 17-18 CCRPC UPWP) | Varies depending on identified improvements | High |
| 16 | **East Spring Street Sidewalk Extension** Construct new sidewalk from Russell Street to East Allen Street | Pedestrian | Short-Term | Incorporate into East Allen Street Gateway Study | $200,000 | High |
| 23 | **Main/Lafountain/Stevens Street Intersection Crosswalk Enhancements** Install rectangular rapid flashing beacons (or equivalent advance warning signage) and curbed bump-out(s) if space permits | Pedestrian | Short-Term | Conduct engineering assessment then construct | $5,000–$30,000 | High |

| PROJECT ID # | PROJECT | TYPE | ESTIMATED IMPLEMENTATION TIMEFRAME | NEXT STEP | CONSTRUCTION COST ESTIMATE | PRIORITY |
|---|---|---|---|---|---|---|
| 20 | **Main/Normand Street Intersection Crosswalk Enhancements** Construct raised median island and rectangular rapid flashing beacons at existing crosswalk location | Pedestrian | Short-Term | Conduct engineering assessment then construct | $30,000 | High |
| 21 | **Main Street between Platt and Union Street Crosswalk Enhancements** Install crosswalk, raised median or curbed bump-outs, and rectangular rapid flashing beacons | Pedestrian | Short-Term | Conduct engineering assessment then construct | $30,000 | High |
| 7 | **East Allen Street Bicycle Lane** Replace merge lane with bike lane in eastbound lane from Cascade Way towards Abenaki Way | Bicycle | Short-Term | Construct (striping) | $5,000 | High |
| 19 | **Malletts Bay / Elm / St. Peter Street Intersection Crosswalk Enhancements** Install rectangular rapid flashing beacons (or equivalent advance warning signage) at existing crosswalk | Pedestrian | – | – | – | Medium |
| 6 | **VT 15 Multiuse Path Connector** Evaluate potential bicycle facility connections from LaFountain Street to the proposed VT 15 multiuse path, with a potential connection through St. Michael's College | Bicycle | – | – | – | Medium |
| 22 | Main Street north of Burling Street Crosswalk Install crosswalk, median, and rectangular rapid flashing beacon | Pedestrian | – | – | – | Medium |
| 33 | **Evaluate Pedestrian Accessibility** Conduct a pedestrian network accessibility audit and prioritize sidewalk, curb ramp, and crossing improvements to ensure all facilities are in fair or better condition and meet minimum Americans with Disabilities Act accessibility requirements | Pedestrian | – | – | – | Medium |
| 26 | **Casavant Natural Area Access** Construct emergency / service vehicle access road to Casavant Natural Area | Roadway | – | – | – | Low |
| 2 | Weaver Street Construct new bicycle facility (protected bicycle lanes or striped bicycle lanes) on Weaver Street with connections to Main Street at Tigan Street and West Allen Street | Bicycle | – | – | – | Low |
| 3 | **Malletts Bay Avenue (north)** Pilot evaluation of protected bike lanes between Colchester town line and Elm Street | Bicycle | – | – | – | Low |

| PROJECT ID # | PROJECT | TYPE | ESTIMATED IMPLEMENTATION TIMEFRAME | | NEXT STEP | CONSTRUCTION COST ESTIMATE | PRIORITY |
|---|---|---|---|---|---|---|---|
| 17 | **North Street**<br>Construct new sidewalk from Pine Street to Cedar Street | Pedestrian | – | – | | – | Low |
| 37 | **Monitor Circulator Operations**<br>Following 2016 construction project continue to monitor functionality and operations at the downtown Circulator | Roadway | – | – | | – | Low |
| 14 | **Champlain Mill Path**<br>Extend Champlain Mill Path to new path along Railroad right of way connecting to Intervale | Bicycle | – | – | | – | Low |
| 4 | **Malletts Bay Avenue (south)**<br>Install shared-use lane markings from Elm Street to West Allen Street | Bicycle | – | – | | – | Low |
| 12 | **Downtown Street Bicycle Accessibility**<br>Add shared-use lane markings along Winooski Falls Way east of the Circulator, and Abenaki Way and Cascade Way north of Winooski Falls Way | Bicycle | – | – | | – | Low |

# APPENDIX C. RESIDENTIAL TRIP GENERATION

The residential trip generation is derived from the development of linear regression models connecting person trips by income from the 2017 NHTS and the number of bedrooms per income from the 2019 AHS.

## 2017 NATIONAL HOUSEHOLD TRAVEL SURVEY

**TABLE 25: 2017 NHTS INCOME AND TRIPS**

| INCOME | ANNUAL PER HH PERSON TRIPS | EST. TRIPS PER HH (DIVIDING ANNUAL BY 365) | NORMALIZED TO MEDIAN |
|---|---|---|---|
| $10,000 | 2,214 | 6.07 | 74% |
| $20,000 | 2,477 | 6.79 | 83% |
| $30,000 | 2,756 | 7.55 | 93% |
| $42,500 | 2,979 | 8.16 | 100% |
| $62,500 | 3,172 | 8.69 | 106% |
| $87,500 | 3,487 | 9.55 | 117% |
| $100,000 | 4,033 | 11.05 | 135% |

*Source: 2017 NHTS & RSG*

## 2019 AMERICAN HOUSING SURVEY

The data used the national summary, Colorado state, and Rochester, New York to identify the mean incomes for housing units by bedroom count. These locations were selected as most similar to Vermont out of the available data.

**TABLE 26: AHS INCOME AND BEDROOM DATA**

| MEAN INCOME | BEDROOMS |
|---|---|
| 42,150 | 0 |
| 54,060 | 1 |
| 59,030 | 2 |
| 81,440 | 3 |
| 132,900 | 4 |
| 24,280 | 0 |
| 56,980 | 1 |
| 76,090 | 2 |
| 97,330 | 3 |
| 148,600 | 4 |
| 19,000 | 1 |
| 45,000 | 2 |
| 58,000 | 3 |
| 89,000 | 4 |

*Source: 2019 AHS*

## COMBINED DATASET

Table 27 shows the combined dataset that includes an income model based on bedrooms as well as observed income data per bedroom from the AHS. The person trips are shown as modeled from the income characteristics from the NHTS. The data inform the linear regression shown in Figure 7.

**TABLE 27: COMBINED DATASET FOR BEDROOM AND TRIP MODEL**

| BEDROOMS | INCOME (SOME MODELED AND SOME ACTUAL) | MODELED ANNUAL PER HH PERSON TRIPS | DAILY PERSON TRIPS (ANNUAL / 365) |
|---|---|---|---|
| 0 | $22,415.83 | 2,522 | 6.91 |
| 1 | $44,750.44 | 2,918 | 7.99 |
| 2 | $67,085.06 | 3,313 | 9.08 |
| 3 | $89,419.67 | 3,708 | 10.16 |
| 4 | $111,754.28 | 4,103 | 11.24 |
| 0 | $22,415.83 | 2,522 | 6.91 |
| 1 | $44,750.44 | 2,918 | 7.99 |
| 2 | $67,085.06 | 3,313 | 9.08 |
| 3 | $89,419.67 | 3,708 | 10.16 |
| 4 | $111,754.28 | 4,103 | 11.24 |
| 1 | $44,750.44 | 2,918 | 7.99 |
| 2 | $67,085.06 | 3,313 | 9.08 |
| 3 | $89,419.67 | 3,708 | 10.16 |
| 4 | $111,754.28 | 4,103 | 11.24 |
| 0 | $42,150.00 | 2,872 | 7.87 |
| 1 | $54,060.00 | 3,082 | 8.44 |
| 2 | $59,030.00 | 3,170 | 8.69 |
| 3 | $81,440.00 | 3,567 | 9.77 |
| 4 | $132,900.00 | 4,478 | 12.27 |
| 0 | $24,280.00 | 2,555 | 7.00 |
| 1 | $56,980.00 | 3,134 | 8.59 |
| 2 | $76,090.00 | 3,472 | 9.51 |
| 3 | $97,330.00 | 3,848 | 10.54 |
| 4 | $148,600.00 | 4,755 | 13.03 |
| 1 | $19,000.00 | 2,462 | 6.75 |
| 2 | $45,000.00 | 2,922 | 8.01 |
| 3 | $58,000.00 | 3,152 | 8.64 |
| 4 | $89,000.00 | 3,701 | 10.14 |

**FIGURE 7: BEDROOM—TRIP MODEL**

**Summary Output**

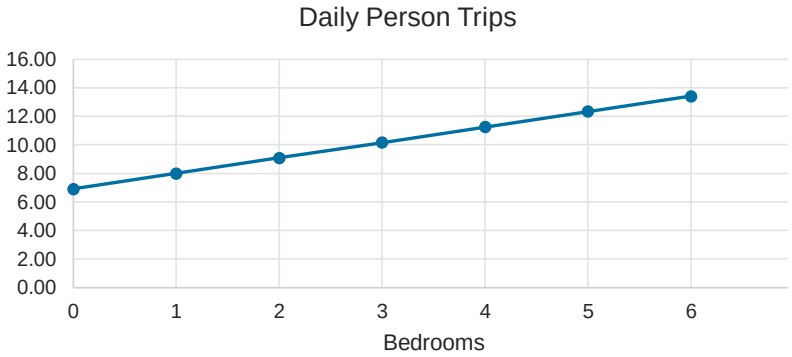
| *Regression Statistics* | |
|---|---|
| Multiple R | 0.909464774 |
| R Square | 0.827126175 |
| Adjusted R Square | 0.820477182 |
| Standard Error | 0.696235192 |
| Observations | 28 |

This **first table** is the bottom-line summary of the quality of the model.

This **second table** shows additional information that describes the regression equation and the characteristics of the coefficients.

| | *Coefficients* | *Standard Error* | *t Stat* | *P-value* |
|---|---|---|---|---|
| Intercept | 6.910713263 | 0.246156313 | 28.07449132 | 5.65098E-21 |
| Bedrooms | 1.082833485 | 0.097085359 | 11.15341691 | 2.08346E-11 |

| Bedrooms | Daily Person Trips |
|---|---|
| 0 | 6.91 |
| 1 | 7.99 |
| 2 | 9.08 |
| 3 | 10.16 |
| 4 | 11.24 |
| 5 | 12.32 |
| 6 | 13.41 |




This shows the model application (visually and in tabular form).

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